IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	HANSE et al.
Title	)	Thermal shock resistant casting element and manufacturing process thereof.
Application Number	)	10/509501
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Group Art Number	)	1725
Examiner	)	Lin, Ing Hour
Attorney Docket No.	)	1396 US (06-50)

Commissioner for Patents
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Sir:

AFFIDAVIT UNDER 37 C.F.R. 1.132

I, Eric Hanse, hereby swear and state that:

1. I have been active in the field of refractory ceramics for the last 20 years.

2. I am currently employed by the Vesuvius France, a subsidiary of Vesuvius Crucible Company, which has more than $1 billion in worldwide refractory sales.

3. I hold a degree in Chemical Engineering from the ISIC University of Mons in Belgium.

4. I am the author or co-author of 10 papers in the field of ceramic engineering.

5. I hold 16 patents or patent applications in the field of ceramic engineering, particularly relating to ceramic articles and mechanisms in the iron and steel industry.

6. I am very familiar with refractory compositions and articles that are used in the molten metal industry, including their methods of use and manufacture.

7. For the past years, I have concentrated on refractory ceramic articles, particularly on pouring shrouds and more particularly ladle shrouds, for use in the continuous casting of steel.

8. I have supervised numerous experimental and commercial installations of pouring shrouds; have witnessed the use of pouring shroud in commercial operation; and am very familiar with the requirements and problems arising with pouring shrouds.

9. The pouring shroud is used to protect molten metal against oxidation during its transfer from an upstream metallurgical vessel into a downstream metallurgical vessel.

10. A regulation device, such as, a slide gate mechanism may be positioned in the bottom of the upper metallurgical vessel. The regulation device comprises a nozzle or a plate to which the pouring shroud is connected.

11. In operation, the pouring shroud must withstand a significant thermal shock at the beginning of casting; temperature varying from ambient temperature to up to 1500°C in a few seconds.

12. For reducing the thermal shock, the pouring shroud of the prior art can be preheated; however, this is not a common practice as it is practically inconvenient.

13. A widely used solution is to manufacture a pouring shroud with an interior bore that is pre-oxidized in its first few millimeters. The oxidized layer contains no carbon and is insulating. The oxidized layer acts as a thermal barrier at the beginning of the casting and thermal shock is reduced. Unfortunately, the oxidized layer is quickly washed away at the earliest stages of casting, thereby reducing the wall thickness of the shroud and decreasing the mechanical strength of the shroud.

14. The insulating coating of the present invention is applied as a slurry to the interior bore of the pouring shroud. Oxidation of the bore is unnecessary. Advantageously, the mechanical strength of the shroud is not compromised. Additionally, the coating forms a gas-impervious layer on the contact with molten metal. The layer is formed by the combined effect of the temperature and the different species contained in the molten metal cast such as inclusions or impurities. Melting point is lowered by the presence of theses species and permits the formation of glassy phases. Thereby, the silica and alumina contained in the coating vitrify and a glassy layer impervious to gases is formed.

15. After use, inspection of the interior bore of the shroud has revealed the glassy impervious layer. The formation of the glassy phase has a positive effect on both the life of the shroud and the quality of the molten metal cast. The impervious layer reduces air/nitrogen pick-up otherwise detrimental to the steel quality.

16. Refractory articles and in particular pouring shrouds comprising an insulating coating on the exterior of the shroud are known in the prior art. The coating on the exterior improves the efficiency of the preheating and reduces heat loss during casting. The temperature reached on the exterior surface of the shroud is less than the one reached by the interior surface (about 300°C lower in steel casting operations). Furthermore, there is no contact with molten metal and the different species cited above. A coating located on the exterior surface of the shroud does not vitrify. I have also supervised and witnessed numerous experimental and commercial installations of refractory articles comprising a coating on the exterior and notably pouring shrouds, I have never observed any vitrification of the coating in the submerged/visible part of the shroud. On the contrary, coating tends to sinter and/or crack.

17. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: August 11, 2006

Eric Hanse